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Claims

[c1] 1. A method for deriving a tracking error signal based on a first analog detection signal and a second analog detection signal, the method comprising:
summing the first analog detection signal and the second analog detection signal to generate an analog sum signal;
utilizing an analog delay device to delay the analog sum signal into a delay signal;
digitalizing the delay signal into a digital delay signal;
transforming the first analog detection signal and the second analog detection signal respectively into a first digital detection signal and a second digital detect signal; and
respectively comparing the digital delay signal with the first digital detection signal and comparing the digital delay signal with the second digital detection signal to generate the tracking error signal.

[c2] 2. The method of claim 1 wherein the analog delay device is an equalizer electrically connected to a digitizer, or a relay.

[c3] 3. The method of claim 1 wherein the analog delay de-

vice is an equalizer electrically connected to a relay.

[c4] 4. The method of claim 1 wherein there is a time difference between the first analog detection signal and the second analog detection signal, and the tracking error signal is derived according to the time difference.

[c5] 5. The method of claim 1 further comprising:
providing a third analog detection signal and a fourth analog detection signal;
summing the first analog detection signal, the second analog detection signal, the third analog detection signal, and the fourth analog detection signal to generate an analog summing signal;
utilizing the analog delay device to delay the analog summing signal into a delay summing signal;
digitalizing the delay summing signal into a digital delay summing signal;
transforming the third analog detection signal and the fourth analog detection signal respectively into a third digital detection signal and a fourth digital detect signal; and
applying a plurality of comparing processes to the digital delay summing signal respectively with the first digital detect signal, the second digital detect signal, the third digital detect signal, and the fourth digital detection signal to generate the tracking error signal.

[c6] 6. The method of claim 1 further comprising:
providing a third analog detection signal and a fourth analog detection signal;
utilizing the analog delay device to respectively delay the first analog detection signal and the third analog detection signal into a first delay detection signal and a third delay detect signal;
digitalizing the first delay detection signal and the third delay detection signal respectively into a first digital delay detection signal and a third digital delay detect signal;
transforming the third analog detection signal and the fourth analog detection signal respectively into a third digital detection signal and a fourth digital detect signal; and
applying a plurality of comparing processes to the first digital delay detect signal, the third digital delay detect signal, the first digital detect signal, the second digital detect signal, the third digital detect signal, and the fourth digital detection signal to generate the tracking error signal.

[c7] 7. A method for deriving a tracking error signal in an optical storage system comprising:
(a)receiving an optical beam reflected and refracted via a recording carrier, the optical beam propagating along a

track direction on the recording carrier according to the tracking error signal;

(b)after proceeding with step(a), according to a plurality of received different portions of the optical beam in space, generating a first analog detection signal and a second analog detection signal, wherein there is a time difference between the first analog detection signal and the second analog detection signal;

(c)after proceeding with step(b), respectively transforming the first analog detection signal and the second analog detection signal into a first digital detection signal and a second digital detect signal;

(d)after proceeding with step(b), summing the first analog detection signal and the second analog detection signal to generate an analog sum signal;

(e)after proceeding with step(d), applying a delay operation to the analog sum signal to be a delay signal;

(f)after proceeding with step(e), digitalizing the delay signal into a digital delay signal; and

(g)after proceeding with step(e) and step(f), respectively comparing the digital delay signal with the first digital detection signal and comparing the digital delay signal with the second digital detection signal to generate the tracking error signal.

[c8] 8. The method of claim 7wherein the optical storage

system comprises an optical sensor, and the optical sensor comprises a plurality of detecting sections, which respectively correspond to the plurality of portions of the optical beam in space for generating a plurality of corresponding output signals according to the plurality of portions of the optical beam.

[c9] 9. The method of claim 8 wherein the optical storage system further comprises a detection signal generating module, which is electrically connected to the optical sensor for providing a combination process for the plurality of output signals to generate the first analog detection signal and the second analog detection signal, so that the time difference between the first analog detection signal and the second analog detection signal represents a deviation between a central spot of the optical beam on the recording carrier and the track direction.

[c10] 10. The method of claim 7wherein the optical storage system comprises an equalizer for executing the delay operation in step(e).

[c11] 11. The method of claim 7wherein the optical storage system comprises a relay for executing the delay operation in step(e).

[c12] 12. The method of claim 7wherein the optical storage

system comprises an equalizer and a relay, and the equalizer and the relay are electrically connected to each other for executing the delay operation in step(e).

[c13] 13. The method of claim 7wherein the optical storage system comprises a first comparator, a second comparator, and a filtering device, the method further comprising:

(h)in step(g), utilizing the first comparator to process the digital delay signal and the first digital detection signal to generate a first comparing signal, utilizing the second comparator to process the digital delay signal and the second digital detection signal to generate a second comparing signal; and

(i)in step(g) and after proceeding with step(h), subtracting the first comparing signal from the second comparing signal to generate a time-difference signal, and utilizing the filtering device to process the time-difference signal to generate the tracking error signal .

[c14] 14. The method of claim 13wherein the first comparator and the second comparator are respectively an XOR (Exclusive OR) logic gate.

[c15] 15. The method of claim 7 further comprising:

(j)in step(b), according to the plurality of received portions of the optical beam, generating a third analog de-

tection signal and a fourth analog detection signal;
(k)after proceeding with step(j), summing the first analog detection signal, the second analog detection signal, the third analog detection signal, and the fourth analog detection signal into an analog summing signal, and applying the delay operation to the analog summing signal to generate a delay summing signal;
(l)after proceeding with step(k), digitalizing the delay summing signal into a digital delay summing signal;
(m)after proceeding with step(j), respectively transforming the third analog detection signal and the fourth analog detection signal into a third digital detection signal and a fourth digital detect signal; and
(n)after proceeding with step(l) and step(m), applying a plurality of comparing processes to the digital delay summing signal respectively with the first digital detect signal, the second digital detect signal, the third digital detect signal, and the fourth digital detection signal to generate the tracking error signal.

[c16] 16. The method of claim 7 further comprising:
(o)in step(b), according to the plurality of received portions of the optical beam, generating a third analog detection signal and a fourth analog detection signal;
(p)after proceeding with step(o), respectively applying the delay operation to the first analog detection signal

and the third analog detection signal to generate a first delay detection signal and a third delay detect signal;
(q)after proceeding with step(p), respectively digitalizing the first delay detection signal and the third delay detection signal into a first digital delay detection signal and a third digital delay detect signal;
(r)after proceeding with step(o), respectively transforming the third analog detection signal and the fourth analog detection signal into a third digital detection signal and a fourth digital detect signal; and
(s)after proceeding with step(q) and step(r), applying a plurality of comparing processes to the first digital delay detect signal, the third digital delay detect signal, the first digital detect signal, the second digital detect signal, the third digital detect signal, and the fourth digital detection signal to generate the tracking error signal .

[c17] 17. A tracking error signal generator used in an optical storage system for generating a tracking error signal comprising:
two signal processing ports for respectively providing a first analog detection signal and a second analog detection signal, wherein there is a time difference between the first analog detection signal and the second analog detection signal;
a synthesizer electrically connected to the two signal

processing ports for synthesizing the first analog detection signal and the second analog detection signal into an analog sum signal;
an analog delay device electrically connected to the synthesizer for delaying and digitalizing the analog sum signal into a digital delay signal;
two digitizers respectively electrically connected to the two signal processing ports for respectively transforming the first analog detection signal and the second analog detection signal into a first digital detection signal and a second digital detect signal; and
a comparing module electrically connected to the analog delay device and the two digitizers for respectively comparing the digital delay signal with the first digital detection signal and comparing the digital delay signal with the second digital detection signal to generate the tracking error signal.

[c18] 18. The tracking error signal generator of claim 17wherein the analog delay device is an equalizer electrically connected to a digitizer, or a relay.

[c19] 19. The tracking error signal generator of claim 17wherein the analog delay device is an equalizer electrically connected to a relay.

[c20] 20. The tracking error signal generator of claim

17wherein the optical storage system further comprises an optical sensor electrically connected to the tracking error signal generator for receiving an optical beam reflected and refracted via a recording carrier, the optical beam propagating along a track direction on the recording carrier according to the tracking error signal.

[c21] 21. The tracking error signal generator of claim 20wherein the optical sensor comprises a plurality of detecting sections, which respectively correspond to the plurality of portions of the optical beam in space for generating a plurality of corresponding output signals according to the plurality of portions of the optical beam.

[c22] 22. The tracking error signal generator of claim 17wherein the two signal processing ports provide a combination process for the plurality of output signals to generate the first analog detection signal and the second analog detection signal, so that the time difference between the first analog detection signal and the second analog detection signal represents a deviation between a central spot of the optical beam on the recording carrier and the track direction.

[c23] 23. The tracking error signal generator of claim 17wherein the synthesizer is an adder.

[c24] 24. A tracking error signal generator comprising:
four signal processing ports for respectively providing a first analog detection signal, a second analog detection signal, a third analog detection signal, and a fourth analog detection signal;
a synthesizer electrically connected to the four signal processing ports for synthesizing the first analog detection signal, the second analog detection signal, the third analog detection signal, and the fourth analog detection signal into an analog summing signal;
an analog delay device electrically connected to the synthesizer for delaying and digitalizing the analog summing signal into a digital delay summing signal;
four digitizers respectively electrically connected to the four signal processing ports for respectively transforming the first analog detection signal, the second analog detection signal, the third analog detection signal, and the fourth analog detection signal into a first digital detect signal, a second digital detect signal, a third digital detect signal, and a fourth digital detect signal; and
a comparing module electrically connected to the analog delay device and the four digitizers for applying a comparing operation to the digital delay summing signal respectively with the first digital detect signal, the second digital detect signal, the third digital detect signal, and

the fourth digital detection signal to generate the tracking error signal.

[c25] 25. The tracking error signal generator of claim 24wherein there is a time difference between the first analog detection signal, the second analog detection signal, the third analog detection signal, and the fourth analog detection signal.

[c26] 26. The tracking error signal generator of claim 24wherein the analog delay device is an equalizer electrically connected to a digitizer, or a relay.

[c27] 27. The tracking error signal generator of claim 24wherein the analog delay device is an equalizer electrically connected to a relay.